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A device for locking the legs of a passenger in a seat

The present invention relates to a device for locking the legs of a passenger in a seat, in particular a seat on an installation for amusement parks.

Various installations are found in amusement parks where vehicles travel in which passengers sit in order to live a novel experience and to have unusual emotions and sensations.

These installations offer a very broad range of sensations ranging from a simple ride, sometimes surprising in ghost trains, to aerial acrobatic figures afforded by roller coasters.

The devices for holding passengers in the seats of the vehicles travelling in these installations are adapted to the speeds and accelerations to which the passengers are subjected. Thus roller coasters are provided with retaining devices including harnesses which constitute veritable yokes which encircle the body of the passenger so as to prevent any risk of ejection of the passenger during travel.

In a particular embodiment of suspended roller coasters, the passengers travel along the circuit, with their backs disposed substantially parallel to the track formed by the rails. Such installations are described in particular in the international patent application publications WO 99/22829 and WO 99/22830. Because of the position occupied by the passengers in these installations, it is necessary not only for the passenger to be held with regard to his body but also to lock his legs.

To this end, the devices proposed in the prior international applications mentioned above propose a device for locking the legs fixed to an element mounted for tilting on the bottom part of the seat support. Amongst other drawbacks, such a device is bulky since it requires an extension of the seat support downwards in order to serve as a support for tilting.

The aim of the present invention is to propose a device for holding the legs of the passenger which remedies the drawbacks of known devices, which is simple to produce, whilst allowing great safety and great comfort for the passenger.

To this end, the invention relates to a device for locking the legs of a passenger in a seat, in particular a seat on an installation for amusement parks, said seat comprising a base of the seat fixed on a support, said device comprising two flaps mounted for articulation at the end of the support of the base of the seat. It also relates to a seat for the transportation of a passenger, in particular in installations for amusement parks, having a said device for locking the legs of the passenger in the seat.

The following description, given by way of example, refers to the drawing, in which:

- Figure 1 is a three-quarter perspective front view of a schematic example of a seat including an example of a locking device according to the invention in the open position,

- Figure 2 is a three-quarter front perspective view of the seat of Figure 1, the locking device being shown in the closed position,

- Figure 3 is a side view partially in cross-section of a seat including a locking device according to the invention in the open position and illustrating one example embodiment of the opening/closing mechanism of the said device,
- Figure 4 is a partial section seen from above of the locking device depicted in Figure 3,
- Figure 5 is a side view similar to that of Figure 3, the locking device being shown in the closed position,
- Figure 6 is a partial section seen from above of the locking device depicted in Figure 5,
- Figure 7 is a side view partially in cross-section of a seat having a locking device according to the invention in the open position and illustrating a first variant embodiment of the opening/closing mechanism of the said device,
- Figure 8 is a partial section seen from above of the locking device depicted in Figure 7,
- Figure 9 is a side view similar to that of Figure 7, the locking device being shown in the closed position,
- Figure 10 is a partial section seen from above of the locking device depicted in Figure 9,
- Figure 11 is a side view partially in cross-section of a seat having a locking device according to the invention in the open position and illustrating a second variant embodiment of the opening/closing mechanism of the said device,
- Figure 12 is a view in partial section seen from above of the locking device depicted in Figure 11,
- Figure 13 is a detail view along A of the mechanism of Figure 11, and

- Figures 14 to 16 are representations similar to those in Figures 11 to 13 but in which the locking device is in the closed position.

Figures 1 and 2 depict a seat having a device for locking the legs of a passenger according to the invention. The seat comprises a base constituting the squab part proper of the seat and having a central protrusion 4 in the shape of a camel's hump, arranged so as to cooperate with the cushion 5 of a harness, and lateral parts 2, 2' extending below the seat and serving for the lateral holding of the legs 3, 3' of the passenger. The locking of the legs 3, 3' is achieved by means of two flaps 10, 10' mounted articulated at the end of the support of the seat base. When they are in the closed position, these flaps cooperate with the base of the seat and in particular with its lateral parts 2, 2' so as to encircle the legs 3, 3' of the passenger seated in the seat.

A first example embodiment of the opening/closing mechanism of the device is depicted in Figures 3 to 6. This mechanism can be mounted for example inside a beam disposed in line with the support of the seat base, at its middle part, so as to project between the legs of the passenger. This mechanism comprises a pedal 11 fixed to a lever 12 mounted for articulation about a horizontal shaft 13 fixed to the support 6 of the seat base 7. The bottom end of the lever 12 is fixed to a horizontal shaft 15 which can slide inside the support 6 of the seat base so as to actuate the movement of closing/opening of the flaps 10, 10'. The lever 12 has a lug 14 projecting towards the rear and mounted for articulation at the end 21 of a hydraulic jack 20 for locking the device.

Each of the ends of the bar 15 is connected by means of a link 16, 16' to one of the ends 18, 18' of a lever 17, 17' fixed to the frame 9, 9' of one of the flaps 10, 10' and the other end of which pivots about a shaft 19, 19' mounted at the end of the support 6 of the seat base. As shown in the drawings, the flaps 10, 10' can consist of a frame 9, 9' covered with polyurethane foam. When, as shown in Figures 3 and 4, the flaps are in the open position, the downward actuation of the pedal 11 gives rise to the movement of the shaft 15 towards the rear (towards the left of the drawing), the shaft 15 in its turn causing the movement of the links 16, 16', which in their turn cause the rotation of the levers 17, 17' about their shafts 19, 19', the consequence of which is the closure of the flaps 10, 10'. At the same time, the pivoting of the lever 12 towards the rear acts on the end 21 of the jack 20 in order to put it under compression.

The hydraulic locking jack 20 can for example be a jack with an electromagnetic valve which locks the fluids in the jack when the pedal 11 is in the low position, the flaps being closed. At this moment, the jack is under compression. Its subsequent release, by tilting its valve, will actuate a movement of the device in the opposite direction, causing the opening of the flaps.

In the two variant embodiments, which will now be described, the closure movement of the flaps is automatically controlled by the closure movement of the harness. For the rest, the functioning of the locking device is similar to that shown in Figures 1 to 6, the identical components being designated by the same reference figures.

According to a first variant embodiment depicted in Figures 7 to 10, the actuation of the lever 12 for the closing/opening of the flaps 10, 10' is effected not by means of the pedal 11 but by means of a cable 25 fixed for example at one of its ends to the end of the lug 14 fixed to the lever 12, and at its other end to a lever 31 fixed to the harness 32, so as to exert a traction on the lug 14 of the lever 12 during the closure movement of the harness or a thrust on this lug during the opening of the harness. The cable 25 is disposed inside a flexible sheath. It is for example possible to use a commercially available cable of the "push-pull" type. In this variant, the extension of the lateral parts 2, 2' of the seat in Figures 1 and 2 is replaced by external hoops 45 trapping the legs.

According to a second variant embodiment depicted in Figures 11 to 16, the assembly is arranged so that the closure of the flaps 10, 10' is effected automatically under the control of a closure movement of the harness. On the other hand, the opening of the flaps and the opening of the harness are controlled separately. For this purpose, the device has a mechanism for temporarily connecting the flaps to the harness.

As depicted in Figures 11 and 14, the device comprises a control system including a connection linkage 30 fixed for articulation at one of its ends to a lever 31 secured to the harness 32 and a control bar 33, fixed by articulation at one of its ends to the end of the lug 14 fixed to the lever 12 making it possible to actuate the closing/opening movement of the flaps 10, 10'. The other respective ends of the connecting linkage 30 and of the control bar 33 are arranged to cooperate with an intermediate cam 34 arranged so as to allow the temporary fixing of the flaps 10, 10' to the harness 32, as

depicted to a larger scale in the detailed Figures 13 and 16, the mechanism being shown in a position corresponding to the open position of the flaps in Figure 13 and in a position corresponding to the closed position of the flaps in Figure 16.

A description will now be given, in more detail, of the mechanism for temporarily fixing the flaps to the harness. As can be seen in Figures 13 and 16, the bottom end of the connecting linkage 30 has a part 35 in the form of a fork between the two arms of which the intermediate cam 34 and an actuating link 36 are disposed. The link 36 is mounted, at one of its ends, for articulation about a shaft 37 fixed to the cam 34, and close to its other end at the bottom end of the part 35 of the linkage 30 by means of a shaft 39. At this same end, the link 36 is also mounted for articulation at the end of a balancing spring 43 serving to counterbalance the inherent weight of the harness when it is in the open position. The cam 34 is in its turn mounted for articulation about a shaft 38 fixed to the end of the control bar 33. A roller 40 is mounted about the shaft 39 between the arms of the fork 36 so as to cooperate with a part 41, in the form of a nose, of the intermediate cam 34. The mechanism is arranged so that, when the passenger lowers the harness, the connecting linkage 30 effects an upward traction in the direction of the arrow t shown in Figure 13, which causes a pivoting of the link 36 upwards, the roller 40 then coming to bear against the nose-shaped part 41 of the intermediate cam 34 and thereby causing the tilting of the intermediate cam 34 in the clockwise direction, which causes a movement of the control bar 30 towards the left, which causes the closure of the flaps 10, 10'. The piercing 42 of the link 36 at the point where it pivots about the shaft 37 is made oval so as to enable the

roller 40 to pass round the nose-shaped part 41 of the cam 34 once the flaps 10, 10' are closed, as can be seen in Figure 16, which then disconnects the movement of the harness from that of the flaps.

The system is thus arranged so that, when the harness has effected two thirds of its downward movement, the flaps are already completely closed and detected as such. At this precise moment, the flaps are locked in their closed position whilst, before awaiting this point, the passenger has every opportunity to open the flaps and harness once again simply by acting on the harness if he wishes to readjust his position in the seat. When the harness has effected two thirds of its travel and the flaps are locked in their closed position, the passenger continues the closure movement of the harness, then disconnected from the movement of the flaps as described above, until he reaches a point in the locking zone of the said harness corresponding to his morphology. The passenger is then ready to start. If the operator perceives, during his check, that the legs of the passenger are not correctly placed in the housings closed off by the flaps, or that the harness is badly adjusted, he can reopen and then close the harness or flaps independently of each other without losing the correct positions already acquired, the opening of the harness or flaps then taking place electrically. Should the operator open only the flaps, their closure will then be effected with the pedal 11.

When the train returns to the station, the opening of the flaps and the opening of the harness are controlled separately by means known per se which it is unnecessary to describe here. When the harness once again reaches its maximum opening position, the intermediate temporary connection cam 34

resets itself automatically under the effect of the balancing spring 43 and by virtue of its geometry. The seat is then ready to accept a new passenger.

Of course, the movement of opening/closing of the flaps can also be obtained by means of any other suitable means, such as for example by means of electric motors which may for example be controlled electronically or synchronized during the opening/closing movement of the harness.